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Hereford and Holstein Steer Performance on High Grain Diets With and Without Corn Silage

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HEREFORD AND HOLSTEIN STEER PERFORMANCE ON HIGH GRAIN DIETS WITH AND WITHOUT CORN SILAGE IN UTAH

by

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of the requirements for the degree

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Hereford and Holstein Steer Performance on High Grain Diets

With and Without Corn Silage

by

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A factorially designed experiment had 18 Hereford and 18 Holstein steers on individually fed, high-grain diets. One diet included 59% rolled barley, 30% CSF beet pulp, 5% protein, vitamin, mineral, and stilbestrol supplement, and 6% chopped hay and straw. The other diet had corn silage (11% air dry matter equivalent) substituted for the chopped roughage and 5% of the beet pulp. The Holsteins were heavier at the start, 752 lb. as compared to the Herefords 686 lb. average. The weight differential was maintained throughout the approximately 180-day trial. The Holstein's feed consumption and rate of gain, 23.4 and 2.71 lb. respectively, were significantly better than the Hereford's 20.1 and 2.23 lb. The average feed conversion difference was not significant, with 8.68 for the Holsteins and 9.20 for the Herefords. There was no significant difference in carcass grade, although the Herefords tended to grade higher and had significantly better conformation scores. The Holsteins had less fat cover, .178 inches as compared to .497 inches, and a significantly higher cutability, with 52% for the Holsteins vs.

50% for the Herefords. Feed conversion was 8.57 for the cattle on the diet containing silage and 9.30 for those on the diet without silage ($P<.05$). This experiment's relatively low level of silage apparently improved palatability and minimized the wastage of "fines." The relatively large variations in all measures among individual animals were considered a significant observation.

(29 pages)

INTRODUCTION

In recent years, dairy type feeder steers have become more popular for finishing (fattening). Since their genetic selection has been based on milk production, the suitability of such steers for finishing, as compared to beef breeds may be controversial. This suitability for finishing and marketing is judged primarily by two measures, feedlot performance and carcass quality.

Limited research indicates that Holsteins are superior to the beef type cattle in feedlot performance, but are inferior in carcass quality. Holsteins are usually fed the shortest time, and have the highest shrink and poorest dressing percentage. Holsteins often grade lower because of lesser marbling and external finish.

Utah farmers have reported factors that favor the use of corn silage over dry-roughages, such as alfalfa hay or straw, in cattle finishing diets. Advantages reported are: (1) increase in palatability of diet when corn silage is included, (2) less incidence of bloat and founder in feedlot cattle, (3) greater yields of forage per acre of farm land. Since varieties of silage corn have been developed for high production in areas of medium growing season, such as Utah, the use of corn silage is of interest in this area.

The purpose of this feeding trial is to: (1) study and evaluate the effect of breed differences (Holstein vs Hereford), on feedlot performance and carcass quality, and (2) to study and evaluate the value of substituting corn silage into a high grain diet, with respect to feedlot performance and carcass quality.

REVIEW OF LITERATURE

Breed Effect

As recently as 1952, the common practice of many dairy farmers was to dispose of their bull calves as veal, soon after birth. This was done because it was not considered profitable to feed milk when it could be marketed to good advantage, Rumery and Baker (1953). Hibbs et al. (1959), reported that beef production in the country could be rapidly expanded, should the need arise, by feeding out male dairy calves that are at present either destroyed, vealed, or sent to market at various stages of development; and that under certain economic conditions, dairymen who have available barn space, feed and labor may find it profitable to raise their male calves, either for feeders or to be fed out to slaughter weight.

In an attempt to investigate the possibility of a dairy-beef enterprise in conjunction with the normal dairy operation as a means of utilizing the excess male calves, McCormick and Kidwell (1953) and McCormick and Myles (1959), indicated that Holstein steers fed an all or high-roughage diet could make outstanding gains. From an initial average weight of 374 lb., to a final average weight of 1,172 lb., the nineteen head averaged 1.83 lb. per day and recorded a feed conversion of 11.3 lb.

Limited research indicates that the Holsteins are usually superior to Herefords in feedlot performance, but are inferior in carcass grade and quality. This is supported by the following reference. Cole et al. (1963), over a five year period, fattened and slaughtered 154 steers

representing three types, British, Zebu, and dairy. Each steer was slaughtered when it reached a weight of 900 lb., or an age of approximately 20 months, whichever was reached first. Among the breeds, Holsteins were on feed the shortest time, had the highest daily gain, and required the least amount of feed per pound of gain (7.76 vs 8.76 for the Herefords). The British breeds graded significantly higher, were fatter and had shorter carcasses, legs and loins than the other breeds.

Larson et al. (1966) compared Herefords and Holsteins in the feedlot using different rations and slaughtering at different weights. Holsteins had the greatest advantage when fed the low roughage (20%) diet and were slaughtered at the lighter weights, but little difference between breeds on rate of gain with high roughage (50%) and longer feeding periods. Feed efficiency was increased on the low roughage diet (6.97 Hereford vs 7.14 Holsteins).

Carcass Characteristics

In a study to compare the cutability and eatability of beef and dairy type cattle, Branaman et al. (1962) subjected twenty-five beef type (mostly Herefords) and twenty-five dairy type (Holstein) carcasses to several tests and measurements These included grade and yield, wholesale cuts, trimmed retail cuts, separable lean, fat and bone, and tenderness and palatability scores. Little difference was found between the beef-type and the dairy-type in high priced wholesale cuts or trimmed retail steaks. The difference in percent separable lean was negligible. However, the beef type had a higher dressing percentage and graded higher.

Callow (1961) compared Herefords, Dairy Shorthorn, and Holstein steers on four levels of nutrition. When the dressing percent of these steers was estimated to be 57%, they were slaughtered. He reported no difference in dressing percentage due to breeds, but dressing percentage was affected by

level of nutrition. The Holstein steers had less fat and more lean at the higher dressing percentages than the Herefords or Shorthorns. It was also observed that the Holsteins were significantly heavier, both live and dressed, than the Herefords.

Quantitative estimates of beef carcass composition have been attempted by several methods. Powell and Huffman (1968) reported that the Hankins and Howe method most accurately estimated carcass fat ($r = 0.94$); however, it was the least practical method. Yield grade was slightly less accurate, followed closely by the Oklahoma method, carcass specific gravity, and the Tennessee, Wisconsin, and Illinois methods. Fat thickness measured at the twelfth rib was the best single measurement for estimating carcass yield. Yield grade and the Tennessee method were the most practical, since both could be readily obtained without any additional cutting or handling of the carcass.

Larson et al. (1966) reported that longer feeding periods increased the dressing percent, the amount of marbling, and the grade. He also indicated that the Herefords had higher yield and heavier carcasses than the Holsteins, fed the same diet and the same length of time. However, the Herefords had a slightly higher average initial weight.

Feed Effect

Much work is being done to determine the value of corn silage in the fattening ration, either as the only source of energy or in combination with other high energy feeds. Several combinations of corn silage were investigated by Hatfield et al. (1968). In 1964, he conducted trials with different combinations of corn and corn silage supplemented with nitrogen and obtained 1.08 to 2.38 lb. average daily gains and feed conversions of 12.2 to 7.3. In 1966, he fed 80 steers diets of 20 lb. corn silage and 15 lb. high moisture corn, supplemented with one lb. soybean meal or urea, and

obtained average daily gain of 2.8 lb. In 1967, 100 steers were assigned to 10 different combinations and levels of corn and corn silage, supplemented to provide a balance of nutrients, and obtained gains of 2.66 to 3.40 lb. per day. This is in agreement with work done by Embry and Fredricksen (1968), Whetzal et al. (1966), and Hammes et al. (1968).

Neumann et al. (1963) found no significant difference in steers finished on either a finishing diet of cracked shelled corn, soybean meal, and limited corn silage, and mixed hay or a growing diet of corn silage, soybean meal and limited hay for part of the trial, then finishing them on the control diet of cracked shelled corn, soybean meal, and limited corn silage and mixed hay.

A "complete" corn silage based diet (40.8% D.M.) was formulated by Klosterman et al. (1965) by adding corn grain (such that it doubled the amount of grain in the silage). Also, 10 lb. urea, 10 lb. dicalcium phosphate and 10 lb. ground limestone were added to the silage at the time of ensiling. This was compared to regular corn silage (30.5% D.M.) fed with ground ear corn (6.3 lb. per day) and urea. The "complete" corn silage produced average daily gain of 2.17 lb.; the regular corn silage, plus ground ear corn and urea resulted in 2.27 lb. per day.

Klosterman et al. (1964) studied the effect of level of ground ear corn upon the rate and economy of gain, and reported that steers fed 11.8 lb. of ground ear corn and corn silage full fed gained 2.39 lb. per day, whereas steers fed 12.8 lb. ground ear corn daily averaged 2.2 lb. per day. He stated that, "These results again demonstrate the value of adding a small amount of corn silage to a ration for fattening cattle. Steers fed silage, ate more total feed daily, gained at a faster rate, yielded a higher percentage of carcass, and graded higher than those full-fed ground ear corn and no silage."

Other methods have been devised to enhance the value of corn silage. Newland et al. (1964) harvested only the center portion of the stalk including the ears and used this "center-cut" corn silage as the only source of energy for fattening cattle, and compared it to regular corn silage, plus shelled corn. The "center-cut" diet promoted gains of 2.46 lb. per day and feed conversion of 16.78 lb., as opposed to 2.59 lb. per day gains and feed conversion of 16.8 lb.

The protein and calcium inadequacies of corn silage are well established as stated by Klosterman (1964), but the utilization of the carotene in the corn grain in a ration of five lb. ground ear corn, 25 lb. corn silage, and 1.5 lb. soybean meal, was sufficient to meet the Vitamin A requirements for growing-fattening steers. Bentley et al. (1955) along with others mentioned earlier, have added urea to corn silage at the time of ensiling to increase its protein content. Twenty lb. of urea per ton of corn silage increased the feeding value and crude protein 6 to 10% wet basis. This urea treated silage compared favorably with corn silage, plus soybean meal.

Hoglund (1962) reported that haylage is as good as corn silage when supplemented with corn grain. The superior feed value of corn silage is due to the grain.

METHODS OF PROCEDURE

Eighteen Holstein and eighteen Hereford steers were obtained for this study. They were of the quality commonly used by cattle feeders of the area and they were not selected for uniformity. They were stratified by beginning weights within breeds and randomly allotted within stratification to feed treatments for a complete factorial, breed-feed experiment.

They were assigned to individual pens, 5 x 28 ft., by alternating breeds in modified randomization. All animals were individually fed and and watered during the experiment, and they were gradually brought to full feed. The diets were calculated on an approximately 90% air dry basis. Diet I consisted of 59% rolled barley, 30% concentrated Steffen's filtrate (CSF), 3/8 inch pelleted beet pulp, 6% chopped hay and straw, and 5% protein, vitamin mineral and stilbestrol pelleted supplement. Diet II had silage at approximately 23% dry matter substituted on a 90% dry matter equivalent basis for 11% of Diet I, all of the chopped hay (6%) and 5% of the beet pulp. These diets meet the minimum requirements as established by the National Research Council's nutrient requirements of beef cattle (1963).

Feed records and body weights were maintained for each animal by two-week intervals. In computing feed conversion, each animal was charged with all feed offered and no allowance was made for feed wasted.

A distinction was made between the main trial and the total trial (Table I). The main trial was the period of time the animals were con-

sidered to be adjusted to the environment and on full feed. The total trial included the adjustment period, 18 to 26 days, for variation in delivery date, vaccinations, and adjustment to change in feed.

Weather observations were made throughout the trial.

Approximately 155 days after purchase, 16 steers were slaughtered. They represented a cross section of each treatment (equal numbers) including some of the better steers and some of the poorer ones. Carcass data from these steers was used to help determine the condition of the remaining 20 steers and when to slaughter them. The remaining 20 steers were slaughtered 27 days later. Carcass measurements included: warm carcass weight, ribeye area, depth of backfat (rind), conformation, marbling score, grade, yield of wholesale cuts, and gross abnormalities.

Analysis of variance was conducted on the feedlot performance and carcass measurements. Regression and correlation analyseses were conducted on the feed-gain data.

RESULTS AND DISCUSSION

Tables 1 and 2 summarize the performance of these feeder steers. The major differences were between breeds with a minimum of difference as a result of feed and no significant breed-feed interaction.

The Holsteins were larger initially (752 lb. vs 686 lb.) for the Herefords) and maintained the weight advantage throughout the trial. The significantly greater feed consumption and daily gain (P .01) of the Holsteins (23.4 lb. and 2.71 lb. vs 20.1 lb. and 2.23 lb.) respectively seems to be a reflection of this body size because feed conversion was not significantly different between the two breeds.

There was a trend in favor of the Herefords for carcass grade and the Herefords did have a better dressing percentage. The carcass conformation was also in favor of the Hereford steers. There was little difference in ribeye area. These advantages of the Herefords were minimized to some extent by the small, significant difference in the marbling of the ribeye and the significantly better yield of wholesale cuts from the Holsteins which was related to the lesser fat cover (rind). The carcass weight was significantly higher for the Holsteins (695 vs 637 lb.) see Table 1. These results are in general agreement with the findings of Cole et al. (1963), although the carcass grade of the Holsteins was lower. Branaman et al. (1962) also found similar results, except that they observed little difference between wholesale cut percentages of the beef and dairy-type cattle.

Table 1. Averages of breed and feed effects for steer finishing, Utah, 1968-68

	Breed effect		Feed effect		
	Hereford	Holstein	With silage	No silage	Standard error[d/]
Number of animals	18	18	18	18	36
Measurement averages					
Initial wt., lb.	686	752	720	718	40.68
End wt., lb.	1064	1221	1158	1126	80.03
Daily feed main trial, lb.	20.9	25.3**	22.9	23.2	.59
Daily feed total trial[c/], lb.	20.1	23.4**	21.6	21.8	.53
Daily gain main trial, lb.	2.46	3.03**	2.88	2.61	.17
Daily gain total trial[c/]	2.23	2.71**	2.56	2.38	.055
Feed conversion, mail trial	8.66	8.42	8.05	9.03**	.223
Feed conversion, total trial[c/]	9.20	8.68	8.57	9.30*	.245
Carcass wt., lb.	637	695*	674	658	17.7
Ribeye area, sq. in.	11.9	11.6	11.5	11.9	.223
Rind, in.	.497	.178**	.308	.367	.032
Yield of cuts[a/], %	50	52**	51	51	.42
Carcass grade[a/]	6.2	7.3	6.6	6.9	.42
Carcass conformation[a/]	4.7	7.9**	6.3	6.3	.26
Ribeye marbling score[b/]	18.4	18.8	17.9	19.3	1.04
Dressing, %	59.9	57.0*	58.3	58.3	

a/ Grades and conformation score were coded a 5 = choice, 6 = choice minus, 7 = good plus and 8 = good

b/ Marbling score was coded as 17 = small, 18 = small minus, 19 = slight plus and 20 = slight

c/ Total trial included an 18 to 26 day adjustment period

d/ Standard error of treatment means for comparison between the main effects of breeds or feed

* P<.05 ** P<.01

Table 2. Subgroups of breed and feed effects and total averages for steer finishing, Utah, 1968-68

	Hereford		Holstein		All
	With silage	No silage	With silage	No silage	
Number of animals	9	9	9	9	36
Measurement averages					
Initial wt., lb.	688	684	752	753	719
End wt., lb.	1085	1042	1232	1209	1142
Daily feed, main trial, lb.	20.9	20.9	25.0	25.5	23.1
Daily feed, total trial[c], lb.	20.1	20.0	23.2	23.6	21.7
Daily gain, main trial, lb.	2.61	2.30	3.15	2.91	2.74
Daily gain, total trial[c], lb.	2.36	2.11	2.77	2.65	2.47
Feed conversion, main trial	8.13	9.18	7.97	8.87	8.54
Feed conversion, total trial[c]	8.72	9.68	8.43	8.93	8.94
Carcass wt., lb.	647	627	700	690	666
Ribeye area, sq. in.	11.6	12.1	11.3	11.8	11.7
Rind, in.	.433	.561	.183	.172	.338
Yield of cuts, %	50	50	51	52	51
Carcass grade[a]	6.1	6.2	7.0	7.6	6.7
Carcass conformation[a]	4.9	4.6	7.8	8.0	6.3
Ribeye marbling score[b]	18.4	18.4	17.4	20.2	18.6
Dressing %	59.8	60.0	56.9	57.1	58.5

a/ Grades and conformation score were coded as 5 = choice, 6 = minus, 7 = good plus and 8 = good

b/ Marbling score was coded as 17 = small, 18 = small minus, 19 = slight plus and 20 = slight

c/ Total trial included an 18 to 26 day adjustment period

The major benefit of the silage feeding was reflected in the feed conversion. In the main trial, it was significantly better ($P < .01$) for the steers fed silage (8.08 vs 9.03). This trend continued for the total trial, ($P < .05$) at a narrower ratio, 8.57 vs 9.30. The advantage is particularly important if the silage is less costly than the feed it replaces. The apparent benefit of the small amount of silage, 8 to 10 lb. per day, wet basis was in increasing the palatability and minimizing the loss of "fines." This observation is supported by Klosterman et al. (1964).

It should be noted that this research reports both "total" trial and "main" trial. This type of reporting was not found in the literature reviewed. Some literature indicated that the cattle were acquired two or three weeks before the trial began, or that certain animals were eliminated from the trial because of poor performance. This tends to bias the results of the trial. The "total" trial represents the actual purchase and sale weights and includes the problems of adjustment to full feed, handling, vaccinating, etc., that are not accounted for in the main trial. This may often result, as in this feeding trial, in lower values for some measures as compared to the period when animals were on full feed. The "total" trial performance would be more applicable to the commercial feeder (Table 1).

Figure I illustrates the difference between "total trial" and "main trial" with reference to daily gain. During the adjustment or pre main-trial period of from 23 to 28 days, depending on receiving date; the gain for the whole group was approximately 1,135 lb. This is less than the gains for any of the following 14 day intervals. This indicates the importance of this period in relation to the total feeding period.

These animals were either purchased without selection from a local auction, or were gate cut from a large herd which increased the chance for variation. Since most cattle fed commercially are purchased in this manner,

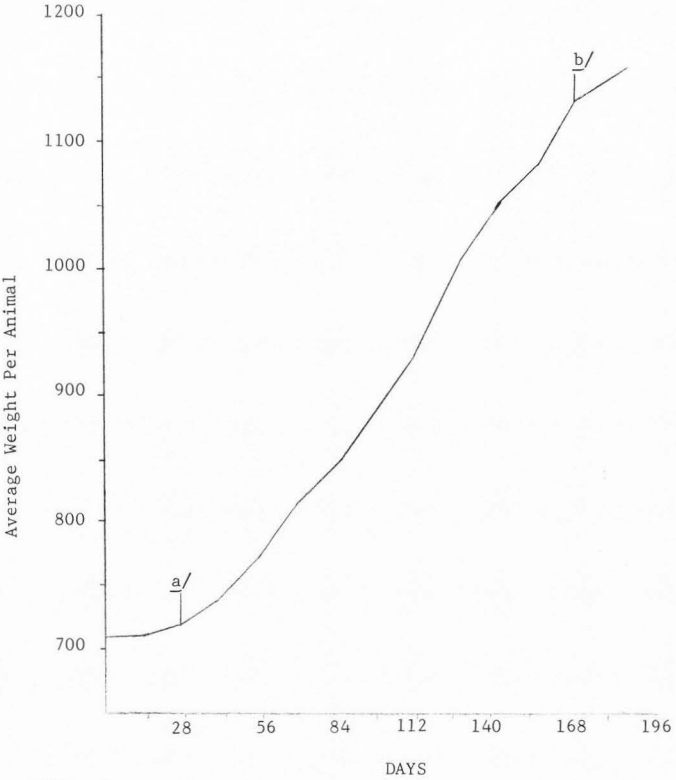

Fig. 1

Change in Weight Per Animal Over Entire Feeding Period, Utah, 1967-68

a/ Adjustment time purchase to full feed.

b/ Sixteen animals slaughtered. Continued response based on remaining 20 animals.

this method of obtaining the animals seemed justified for practical application. However, if the more efficient animals could be selected at the time of purchase, the opportunity for profit could be increased.

This relatively large variation in all measures among individual animals was considered a significant observation. Table 3 summarizes the variation in feed conversion among all the animals and shows a range of 7.16 to 12.02 for all animals. The variation within breed was 7.16 to 9.83 for the Holsteins and 7.22 to 12.02 for the Herefords.

Table 3. Individual values for feed conversion of the 36 steers on trial (units of feed per unit of gain)

	Silage a/		Grain a/	
	Hereford	Holstein	Hereford	Holstein
	7.22	8.88	8.94	7.55
	8.36	8.18	10.55	7.69
	7.86	7.88	12.02	8.93
	8.51	9.18	9.70	9.32
	9.48	9.60	8.42	9.47
	11.88	7.85	9.66	9.32
	7.67	7.16	8.46	8.76
	9.09	8.64	10.30	9.52
	8.41	8.46	9.06	9.83
Av.	8.72	8.43	9.68	8.93

a/ The "grain" diet was 59% rolled barley, 30% CSF beet pulp, 6% chopped roughage, and 5% protein, mineral, vitamin and stilbestrol supplement. The "silage" diet had 11% silage (90% dry matter equivalent) substituted for the roughage and 5% of the beet pulp.

Table 4 summarizes the variation in the average daily gains among all animals and shows a range of 1.30 lb. to 3.27 lb. per day for all animals. The variation within breed was 1.30 lb. to 2.94 lb. per day for the Herefords and 2.17 lb. to 3.27 lb. per day for the Holsteins.

Table 4. Individual values for average daily gain of the 36 steers on trial

	Silage a/		Grain a/	
	Hereford	Holstein	Hereford	Holstein
	lb.	lb.	lb.	lb.
	2.84	2.79	2.52	3.01
	2.47	3.19	2.08	2.58
	2.94	3.05	1.30	2.71
	2.45	2.55	2.12	2.84
	1.96	2.17	2.22	2.55
	1.52	2.67	2.32	2.70
	2.72	3.27	2.72	2.66
	2.44	2.65	1.50	2.57
	1.86	2.60	2.22	2.21
Av.	2.36	2.77	2.11	2.65

a/ The "grain" diet was 59% rolled barley, 30% CSF beet pulp, 6% chopped roughage, and 5% protein, mineral, vitamin and stilbestrol supplement. The "silage" diet had 11% silage (90% dry matter equivalent) substituted for the roughage and 5% of the beet pulp.

Regression and correlation analyses were computed on the feed and gain data. There were no significant differences in regression as a result of treatments so all 36 animals were used in the prediction equations. Average daily gain could be predicted from the feed consumed by the equation:

$$\text{gain} = -0.44 + 0.134 \text{ (feed)}$$

with a coefficient of determination (r^2) of 0.65. This indicates a reasonable linear relationship within the relatively short range of values available as a result of the experiment.

The feed conversion, units of feed per unit of gain, was estimated from the gain data by the equation:

$$\text{Feed conversion} = 13.58 - 1.88 \text{ (gain)}$$

The coefficient of determination was 0.59. Butcher (1964) reported that

this relationship was not linear with fattening lambs, but could be transformed to linearity by using the reciprocal of gain. When this transformation was applied to these cattle data, it resulted in a coefficient of determination of 0.61 which is very little improvement. Linearity of the entire relationship may still be questioned because calculation of feed conversion at zero gain from the above equation would be 13.58, which is impossible. The most logical explanation of the results of this experiment would be that the range of gain (1.30 to 3.27 lb. per day) was within an area of the curve, that approached linearity as near as could be determined within the variability of the animals studied.

Another observable variation among the animals was a definite like and dislike for certain feeds in the diet. With individual feeding, this can easily be observed. Some animals would pick out the grain and leave the beet pulp, while other animals would pick out the beet pulp and leave the grain. The same held true for the silage; some animals would pick it out, and others would leave it. These variations are not as easily detected in group fed cattle. A noticeable trend was that the animals that did not eat the pelleted part of the diet, which included the beet pulp and the protein supplement, did not do as well as those eating the whole diet.

Weighing the cattle at two-week intervals revealed some interesting observations. While the daily feed consumption remained fairly constant, the weight gained from one interval to the next was very uneven. Some cattle would show very little, or no gain at all, for a two-week interval, but would show as high as 75 to 100 lb. gain for the next interval.

Temperature and precipitation measurements were taken daily and observed in relation to the performance of the animals. The only apparent

relation was the minimum temperature the day before weighing. As this temperature went down, the apparent feed per unit of gain went up and the daily gains went down for the preceeding two-week interval.

SUMMARY AND CONCLUSION

A factorially designed experiment had 18 Herefords and 18 Holstein steers on individually fed, high-grain diets. One diet included 59% rolled barley, 30% CSF beet pulp, 5% protein, vitamin, mineral and stilbestrol supplement, and 6% chopped hay and straw. The other diet had corn silage (11% air dry matter equivalent) substituted for the chopped roughage and 5% of the beet pulp. The Holsteins were heavier at the start, 752 lb., as compared to the Herefords 686 lb. average. The weight differential was maintained throughout the approximately 150-day trial. The Holsteins' feed consumption and rate of gain (23.4 and 2.71 lb.) respectively, were significantly better ($P < .01$) than the Herefords' (20.1 and 2.23 lb.). The average feed conversion difference was not significant, with 8.68 for the Holsteins and 9.20 for the Herefords. There was no significant difference in carcass grade, although the Herefords tended to grade higher and had significantly better carcass conformation scores ($P < .01$). The Holsteins had less fat cover, .178 inches compared to .497, and a significantly higher cutability ($P < .01$) -- 52% for the Holsteins vs 50% for the Herefords. Feed conversion was 8.57 for the cattle on the diet containing silage and 9.30 for those on the diet without silage ($P < .05$). This experiment's relatively low level of silage apparently improved palatability and minimized the wastage of "fines."

The period of time between the purchase of the animals and their reaching full feed is critical and expensive. If any technique could be used that would shorten this time or increase the efficiency of the animals during this time, the chance for additional profits would be increased.

It was concluded that for practical application to both the large and small commercial cattle feeder, the total time the cattle are owned, from purchase to slaughter, should be the basis for reporting feeding trial data. This type of reporting, although not found in the literature reviewed, gives a more realistic approach to the practical problems of cattle feeding.

Because of individual feeding, it was concluded that the variability among the animals in feed consumption and gain was greater than had been expected. The most apparent variability was in the eating habits and the likes and dislikes for certain feed in the diet. If the more efficient animals could be selected at the time of purchase, the opportunity for profit would be greatly increased.

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